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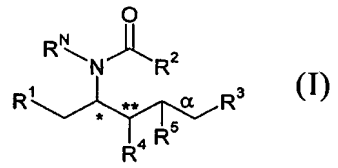
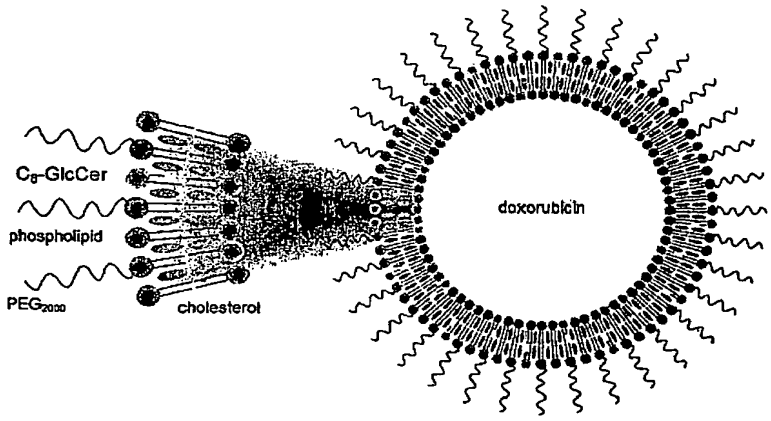
(54) Title: PHARMACEUTICAL FORMULATIONS EMPLOYING SHORT-CHAIN SPHINGOLIPIDS AND THEIR USE





(57) Abstract: This invention pertains to pharmaceutical formulations which comprise (i) a drug (e.g., an amphiphilic drug) (e.g., an anthracycline) (e.g., doxorubicin) and (ii) a short-chain sphingolipid (e.g., a short-chain glycosphingolipid or a short-chain sphingomyelin) (e.g., N-octanoyl-glucosylceramide, referred to as C_8-GlcCer) (e.g., N-hexanoyl-sphingomyelin, referred to herein as C_6-SM), and which provide improved drug delivery and efficacy. The short-chain sphingolipidis selected from compounds of the following formula (I), wherein R^1 is independently: an O-linked saccharide group; or an O-linked polyhydric alcohol group; or: R^1 is independently: an O-linked (optionally N-(C_{1-4}alkyl)-substituted amino)-C_{1-6}alkyl-phosphate group; or an O-linked (polyhydric alcohol-substituted)C_{1-6}alkyl-phosphate group; R^2 is independently C_{3-9}alkyl, and is independently unsubstituted or substituted; R^3 is independently C_{7-19}alkyl, and is independently unsubstituted or substituted; R^4

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is independently -H, -OH, or -O-C_{1-4}alkyl; R^N is independently -H or C_{1-4}alkyl; the bond marked with an alpha (α) is independently a single bond or a double bond; if the bond marked with an alpha (α) is a double bond, then R^5 is -H; if the bond marked with an alpha (α) is a single bond, then R^5 is -H or -OH; the carbon atom marked (*) is independently in an R-configuration or an S-configuration; the carbon atom marked (**) is independently in an R-configuration or an S-configuration; and pharmaceutically acceptable salts, solvates, esters, ethers, chemically protected forms thereof. In one embodiment, the pharmaceutical formulation is a liposomal pharmaceutical formulation prepared using a mixture of lipids comprising, at least, vesicle-forming lipids (e.g., phospholipids) (e.g., phosphatidylcholines) (e.g., fully hydrogenated soy phosphatidylcholine (HSPC)) (e.g., dipalmitoyl-phosphatidylcholine (DPPC)) and said short-chain sphingolipid, and optionally cholesterol and optionally a vesicle-forming lipid which is derivatized with a polymer chain (e.g., a phosphatidylethanolamine (PE) which is derivatized with polyethyleneglycol (PEG)) (e.g., N-(carbonyl-methoxypolyethylene glycol 2000)-1,2-distearoyl-sn-glycero-3-phosphoethanolamine sodium salt (MPEG2000-DSPE). The present invention also pertains to methods for the preparation and use of such formulations.